

# **SPECIFICATIONS D500**

## **PART 1 - GENERAL**

### **1.1 INCLUDES**

A. Composite floor joist system of steel joists with cast-in-place concrete slab.

### **1.2 RELATED SECTIONS**

A. Section 03300 Cast-In-Place Concrete.

### **1.3 REFERENCES**

A. ACI 301 - Specifications for Structural Concrete

B. ACI 318 - Building Code Requirements for Structural Concrete

C. AISC Specification for the Design of Cold-Formed Steel Structural Members

D. ASTM A 1008 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High Strength Low-Alloy with Improved Formability.

E. ASTM C 39 - Standard Test Method for Compressive Strength of Cylinders Concrete Specimens.

F. AWS D1.1 Structural Welding Code Steel.

### **1.4 DESIGN REQUIREMENTS**

A. Design of Composite Floor Joist System:

1. Flexural Design: Ultimate Strength Method and as described by manufacturer.
2. Joist Top Chord Member: AISC Specification for the Design of Cold-Formed Steel Structural Members.
3. Concrete Slab: ACI 318

B. Design Joists to Resist Combined Weight of:

1. Wet concrete (specified slab thickness)
2. Welded wire fabric reinforcement
3. Formwork
4. Rollbar®
5. Construction Live Load: 20 psf maximum

### **1.5 SUBMITTALS**

A. Comply with Section 01330 Submittal Procedures.

B. Product Data: Submit manufacturer's product data for composite floor joist system.

C. Shop Drawings: Submit shop drawings indicating material lists; mark numbers; types, locations and spacing of joists and accessories; and special conditions requiring top or bottom bracing.

1. Calculated dimensions on shop drawings shall be used.
2. Scaling of drawings shall not be permitted.

### **1.6 QUALITY ASSURANCE**

A. Welding Materials and Methods of Fabrication: Manufacturer's standard shop practice.

B. Welder's Qualifications: Certify that each welder is certified by the Canadian Welding Bureau which is equivalent to AWS.

1. Joist Repairs and Modifications in Field: Performed by AWS certified welders in accordance with AWS D1.1.

## **1.7 DELIVERY, STORAGE AND HANDLING**

A. Delivery:

1. Deliver joists to site banded in nested bundles and tagged with Identification Plate attached at one end, at joist shoe.

2. Indicate on Joist Identification Plates:

- a. Manufacturer
- b. Country (Plant)
- c. Project number
- d. Joist mark

B. Storage:

1. Store materials in accordance with manufacturer's instructions.
2. Protect materials from corrosion, deformation, and other damage.
3. Store joists upright on level surface, off ground.
4. Do not stack joists.

C. Handling:

1. Protect joists from damage during unloading, storage, handling, and installation.
2. Hoist joists by crane in accordance with manufacturer's instructions.

## **PART 2 - PRODUCTS**

### **2.1 SUPPLIER**

A. Swirnow Structures LLC, 2400 Sisson Street Baltimore, Maryland 21211-2903 Phone (866) 338-8833 / (410) 338-1122 Fax (410) 338-1124 Website: [www.swirnow.com](http://www.swirnow.com).

### **2.2 COMPOSITE FLOOR JOIST SYSTEM**

A. Designation: Hambro® Composite Floor Joist System

B. Joists with Standard Bearing Shoes and Rollbars: Furnished by Supplier

C. Joists:

1. Joist Depth: as indicated on the drawings.
2. Top chord member:

- a. Act as a continuous shear connector
- b. ASTM A 1008, cold rolled steel, 13 gauge minimum
- c. Fy: 65 ksi minimum

3. Bottom Chord Member:

- a. Hot-rolled or cold-rolled steel angles
- b. Fy: 55 ksi

4. Web Members:

- a. Hot-rolled steel bars,  $\frac{7}{16}$  inch diameter minimum, some continuous
- b. Bent at top chord joist locations
- c.  $F_y$ : 50,000 psi minimum

5. Shop painting: Rust-inhibitive primer

D. Rollbar

- 1. Steel
- 2. Removable
- 3. Design to support the following, until formwork is removed after concrete has reached a minimum compressive strength of 500 psi, determined by testing concrete cylinders in accordance with ASTM C 39.

- a. Plywood forms
- b. Slab dead weight
- c. Welded wire fabric weight
- d. Construction Total Non-Composite Load 61.25 psf, typical

4. Act as temporary bridging and spacers for joists.

E. Standard Bearing Shoes

- 1. Angle Shape: Steel, 4 inches by  $1-\frac{3}{4}$  inches by  $\frac{1}{4}$  inch,  $4-\frac{3}{4}$  inches wide, unless otherwise indicated on the drawings
- 2. Shop Painting: Rust-inhibitive primer

F. Forms: Plywood

- 1. Sheets: 4 feet by 8 feet typical
- 2. Thickness:  $\frac{3}{8}$  inch

G. Concrete:

- 1 Compressive Strength,  $f'_c$ : 3,500 psi @ 28 days
- 2. Standard Weight: 145 pcf
- 3. Aggregate Size:  $\frac{1}{2}$  inch
- 4. As specified in Section 03300, unless specified otherwise in this section.

H. Concrete Reinforcement: welded wire fabric.

- 1. Size: As indicated on the drawings.
- 2.  $F_y$ : 60,000 psi minimum
- 3. Flat Sheets. Do not use rolls.
- 4. As specified in Section 03300 unless specified otherwise in this section.

**2.3 FABRICATION**

A. Fabrication: Manufacturer's standard shop practice.

B. Joist Top Chord: Fabricate joist top chord to allow for  $1-\frac{1}{2}$  inch embedment into concrete slab.

C. Joist Cambers: Approximate camber will be as follows:

Joist Span (Range)	Prefabricated Camber
15 ft. to 20ft.	$\frac{1}{2}$ in. to $\frac{3}{4}$ in.
20 ft. to 25 ft.	$\frac{3}{4}$ in. to $\frac{7}{8}$ in.

25 ft. to 30 ft.

$\frac{7}{8}$  in. to  $1-\frac{1}{16}$  in.

30ft. to 40 ft.

$1-\frac{1}{16}$  in. to  $1-\frac{1}{2}$  in.

## **2.4 SOURCE QUALITY CONTROL**

### **A. Joists:**

1. Manufacturer's facility having continuous quality control program and subjected to plant inspections by approved independent agency.
2. Inspection shall include checking:

- a. Size
- b. Span
- c. Assembly
- d. Welds

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas to receive composite floor joist system.
- B. Notify Engineer of conditions that would adversely affect installation.
- C. Do not start installation until unsatisfactory conditions are corrected.

### **3.2 INSTALLATION**

#### **A. Install composite floor joist system in accordance with the following:**

1. Hambro Installation Guide
2. Field-Use Shop Drawings
3. Amendments issued by Supplier

#### **B. Construction Loads**

1. Do not exceed load-carrying capacity of composite floor joist system with construction loads.
2. Concentrated construction loads: Do not place loads (i.e. bundles of plywood, mesh, sheetrock or Rollbars), exceeding the design load of the slab, on joist system, but rather on supporting walls or beam.
3. Construction loads exceeding design load capacity must be fully supported, and shored to grade.

#### **C. Erect joists level, plumb and to proper locations and elevations.**

#### **D. Perform shimming as required with metal shim material, ensuring total shoe contact.**

#### **E. Special Conditions requiring top and/or bottom bracing shall be indicated on the Field-Use Shop Drawings, prepared by the Supplier.**

#### **F. End Anchorage: Anchor or embed joist shoes as indicated on the drawings.**

#### **G. Joist Sweep: After installation, allowable joist sweep shall be 1 inch in 20 feet.**

#### **H. Minimum Joist Bearing:**

1. Steel Supports:  $2-\frac{1}{2}$  inches
2. Masonry and Concrete Supports:  $3-\frac{1}{2}$  inches
3. Bearing Capacity of Supporting Units: Comply with applied shoe end reaction, based on minimum supplied bearing areas as follows:

- a. Bearing on structural steel: 11.8 square inches
- b. Other Bearing Conditions: 16.6 square inches

I. Damaged Joists:

- 1. Do not install damaged joists.
- 2. Repair or replace damaged joists before installation.
- 3. Do not make field repairs to damaged joists without written approval from the Engineer of Record.
- 4. Make repairs to damaged joists in accordance with suggested repair details from the Supplier.
- 5. Receive written approval from Engineer of Record of joist repair before installation.

### **3.3 CONCRETE PLACEMENT**

A. Concrete:

- 1. In accordance with ACI 301
- 2. As specified in Section 03300, unless specified otherwise in this Section.

B. Welded Wire Fabric:

- 1. Laps: In accordance with ACI 318
- 2. As specified in Section 03300, unless specified otherwise in this section.

C. Place concrete to slab thickness as indicated on the drawings. Do not pour concrete in excess of the thickness indicated on the drawings. Reduce Rollbar spacing for thickened slabs.

D. Maintain minimum depth of concrete cover above joist top chord in accordance with manufacturer's instructions.

E. Construction Loads: Do not drop bucket loads of concrete in concentrated area over joists.

F. Vibrate concrete lightly but thoroughly. Ensure full encasement of the joist top chord in concrete.

G. Construction Joints:

1. Parallel to Joists:

- a. Locate construction joints midway between joists.
- b. Do not locate construction joints closer than *6 inches* from top chord.

2. Perpendicular to joists:

- a. Locate construction joints over supporting wall or beam.

H. Formwork Removal: Remove formwork after concrete has reached a minimum compressive strength of 500 psi, as determined by testing concrete cylinders in accordance with ASTM C 39.

### **3.4 PROTECTION**

A. Protect concrete as required to avoid damage.

#### **IMPORTANT ACCOUSTICAL NOTE:**

The International Building Code (IBC) SEC 1 206 requires a minimum Sound Transmission Class (STC) and Impact Insulation Class (IIC) rating of 50.

The Design Professional should evaluate the specific requirements for the project and determine how the ratings will be achieved.

Laboratory tests were performed on a Hambro assembly consisting of a concrete slab, the Hambro joists, metal furring channels and a drywall ceiling. Hambro was able to achieve a Sound

Transmission Class (STC) = 57, and an Impact Insulation Class (IIC) = 30. The IIC is a rating designed to measure the impact sound insulation provided by floor/ceiling construction.

Most bare structural floor systems do not achieve IBC's minimum IIC rating of 50. The IIC of any assembly is strongly dependent on the floor finishes and underlayment. Bare concrete or direct applied hard floor finishes do not provide adequate protection against the transfer of impact noise. It is recommended that a pliable, resilient, insulation underlayment, or other method, be included wherever hard floor finishes such as ceramic tile or hardwood are used.

A wide variety of systems are available to address this issue. The Design Professional should evaluate the requirements for the project and determine how the ratings will be achieved.